

What is claimed is:

1. An apparatus for measuring a magnetic field produced by an insertion device comprising:
 - (a) a magnetic field strength sensor, wherein the sensor produces an output signal;
 - (b) a first stage for positioning the sensor along a first axis of the insertion device, wherein:
 - (i) the first stage comprises:
 - (a) a first stage carriage,
 - (b) first stage guide means comprising a first end and a second end,
 - (c) a first stage motor,
 - (d) a first stage drive mechanism, and
 - (e) first stage position-sensing means, and
 - (ii) the first stage guide means is mounted on the insertion device, wherein:
 - (f) the axis of the first stage guide means is parallel with the first axis, and
 - (g) the first axis is the long axis of the insertion device;
 - (c) means for controlling position of the first stage;
 - (d) a second stage for positioning the sensor along a second axis of the insertion device, wherein:
 - (i) the second stage comprises:
 - (a) a second stage carriage,
 - (b) second stage guide means,
 - (c) a second stage motor,
 - (d) a second stage drive mechanism, and
 - (e) second stage position-sensing means,
 - (ii) the second axis is perpendicular to the first axis, and

- (iii) the second stage is mounted on the first stage;
 - (e) means for controlling position of the second stage;
 - (f) a third stage for positioning the sensor along a third axis of the insertion device, wherein:
 - (i) the third stage comprises:
 - (a) a third stage carriage,
 - (b) third stage guide means,
 - (c) a third stage motor,
 - (d) a third stage drive mechanism, and
 - (e) third stage position-sensing means,
 - (ii) the third axis is perpendicular to the first axis and to the second axis;
 - (iii) the third stage is mounted on the second stage, and
 - (iv) the sensor is mounted on the third stage;
 - (g) means for controlling position of the third stage; and
 - (h) information storage means for reading the output signal from the sensor operably connected to the sensor.
2. The apparatus of claim 1 wherein:
- (i) the means for controlling position of the first stage,
 - (ii) the means for controlling position of the second stage,
 - (iii) the means for controlling position of the third stage, and
 - (iv) the information storage means
- is a digital computer.
3. The apparatus of claim 1 wherein the first axis is parallel with the electron beam line within the insertion device.

4. The apparatus of claim 1 wherein the output signal is an analog signal.
5. The apparatus of claim 4 additionally comprising:
 - (j) means for converting the analog signal to a digital signal operably connected to the sensor.
6. The apparatus of claim 4 additionally comprising:
 - (k) means for amplifying the analog signal operably connected to the sensor.
7. The apparatus of claim 6 additionally comprising:
 - (l) means for converting an amplified analog signal to a digital signal operably connected to the amplifying means.
8. The apparatus of claim 4 wherein the sensor comprises a Hall-effect probe.
9. The apparatus of claim 8 additionally comprising
 - (m) means for amplifying the analog signal operably connected to the Hall-effect probe;
 - (n) a teslameter operably connected to the amplifying means;
 - (o) means for converting an amplified analog signal to a digital signal operably connected to the information storage means.
10. The apparatus of claim 1 wherein the output signal is a digital signal.
11. The apparatus of claim 1 wherein the first stage guide means is a granite guide rail.
12. The apparatus of claim 1 wherein the first stage guide means is a pair of steel guide rails.

13. The apparatus of claim 1 wherein a portion of the apparatus is removable.
14. The apparatus of claim 13 wherein the removable portion of the apparatus is the entire apparatus.
15. The apparatus of claim 13 wherein the first stage motor comprises a slider and a stator.
16. The apparatus of claim 15 wherein the removable portion of the apparatus comprises the third stage, the second stage, the first stage carriage, the slider of the first stage motor, the first stage drive mechanism and the first stage position-sensing means.
17. The apparatus of claim 13 additionally comprising means for positioning the removable portion of the apparatus on a holding cart.
18. The apparatus of claim 17 wherein the means for positioning the removable portion of the apparatus is a mating guide socket mounted on the first end of the first stage guide means.
19. A method for measuring magnetic fields produced by at least two insertion devices comprising:
 - (1) installing on a first insertion device an apparatus for measuring a magnetic field produced by the insertion device wherein the apparatus comprises a removable portion and wherein the apparatus comprises:
 - (a) a magnetic field strength sensor, wherein the sensor produces an output signal;
 - (b) a first stage for positioning the sensor along a first axis of the insertion device, wherein:

(i) the first stage comprises:

- (a) a first stage carriage,
- (b) first stage guide means comprising a first end and a second end,
- (c) a first stage motor,
- (d) a first stage drive mechanism, and
- (e) first stage position-sensing means, and

(ii) the first stage guide means is mounted on the insertion device,
wherein:

- (f) the axis of the first stage guide means is parallel with the first axis, and
- (g) the first axis is the long axis of the insertion device;

(c) means for controlling position of the first stage;

(d) a second stage for positioning the sensor along a second axis of the insertion device, wherein:

(i) the second stage comprises:

- (a) a second stage carriage,
- (b) second stage guide means,
- (c) a second stage motor,
- (d) a second stage drive mechanism, and
- (e) second stage position-sensing means,

(ii) the second axis is perpendicular to the first axis, and

(iii) the second stage is mounted on the first stage;

(e) means for controlling position of the second stage;

(f) a third stage for positioning the sensor along a third axis of the insertion device, wherein:

(i) the third stage comprises:

- (a) a third stage carriage,
- (b) third stage guide means,
- (c) a third stage motor,
- (d) a third stage drive mechanism, and
- (e) third stage position-sensing means,
- (ii) the third axis is perpendicular to the first axis and to the second axis;
- (iii) the third stage is mounted on the second stage, and
- (iv) the sensor is mounted on the third stage;

(g) means for controlling position of the third stage; and

(h) information storage means for reading the output signal from the sensor operably connected to the sensor;

(2) measuring a magnetic field produced by the first insertion device with the apparatus;

(3) removing the removable portion of the apparatus from the first insertion device;

(4) installing the removable portion of the apparatus on a second insertion device; and

(5) measuring a magnetic field produced by the second insertion device with the apparatus installed on the second insertion device.

20. The method of claim 19 wherein the removable portion of the apparatus is the entire apparatus.

21. The method of claim 19 wherein the first stage motor comprises a slider and a stator.

22. The method of claim 21 wherein the removable portion of the apparatus comprises the third stage, the second stage, the first stage carriage, the slider of the first stage

motor, the first stage drive mechanism and the first stage position-sensing means and wherein a second first stage guide means and a second first stage motor stator are installed on the second insertion device.

23. The method of claim 19 wherein the apparatus additionally comprises means for positioning the removable portion of the apparatus on a holding cart.
24. The method of claim 23 wherein the means for positioning the removable portion of the apparatus is a mating guide socket mounted on the first end of the first stage guide means.